

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
25 August 2005 (25.08.2005)

PCT

(10) International Publication Number
WO 2005/078786 A1

(51) International Patent Classification⁷: **H01L 21/331**

(21) International Application Number:
PCT/US2004/001555

(22) International Filing Date: 16 January 2004 (16.01.2004)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant (for all designated States except US): **INTERNATIONAL BUSINESS MACHINES CORPORATION** [US/US]; New Orchard Road, Armonk, NJ 10504 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **CHEN, Huajie** [CN/US]; 622 Avalon Lake Road, Danbury, CT 06810 (CN). **BEDELL, Stephen, W.** [US/US]; 32 Nicole Drive, Wappingers Falls, NY 12590 (US). **SADANA, Devendra, K.** [US/US]; 90 Sky Top Drive, Pleasantville, NY 10570 (US). **MOCUTA, Dan, M.** [US/US]; 73 Heritage Lane, LaGrangeville, NY 12540 (US).

(74) Agent: **ANDERSON, Jay, H.**; International Business Machines Corporation, Zip 482, 2070 Route 52, Hopewell Junction, NY 12533 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:

— of inventorship (Rule 4.17(iv)) for US only

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 2005/078786 A1

(54) Title: METHOD OF FORMING THIN SGOI WAFERS WITH HIGH RELAXATION AND LOW STACKING FAULT DEFECT DENSITY

(57) Abstract: A method of forming a silicon germanium on insulator (SGOI) structure. A SiGe layer (104) is deposited (300) on an SOI wafer (102, 100). Thermal mixing of the SiGe and Si layers is performed (302) to form a thick SGOI (106) with high relaxation and low stacking fault defect density. The SiGe layer (110) is then thinned (306) to a desired final thickness. The Ge concentration, the amount of relaxation, and stacking fault defect density are unchanged by the thinning process. A thin SGOI film is thus obtained with high relaxation and low stacking fault defect density. A layer of Si (112) is then deposited on the thin SGOI wafer. The method of thinning includes low temperature (550°C-700°C) HIPOX or steam oxidation, in-situ HCl etching in an epitaxy chamber, or CMP. A rough SiGe surface resulting from HIPOX or steam oxidation thinning is smoothed with a touch-up CMP, in-situ hydrogen bake and SiGe buffer layer during strained Si deposition, or heating the wafer in a hydrogen environment with a mixture of gases HCl, DCS and GeH4.